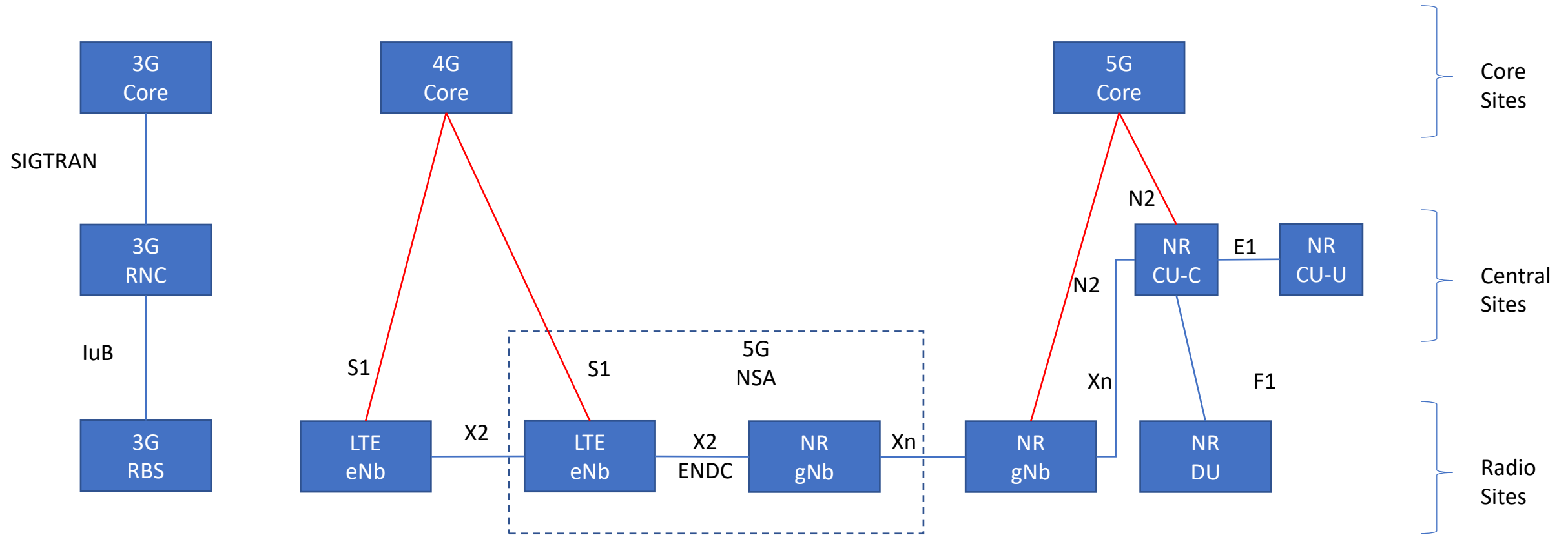# SCTP in the age of QUIC

How SCTP is being used in RAN and why it's difficult the get rid of it

SCTP in Radio Access Network

- RAN is hierarchical, there's strict relationship among cluster of nodes and neighborhood
- Different RAN generation cooperate by means of control signaling (i.e. 5G NSA).
- Interoperability between vendors and between operators, even between RAN generation, is absolutely mandatory
- A RAN lifetime is > 10 years, SCTP is going to be used for many years.

The RAN is fine engineered network
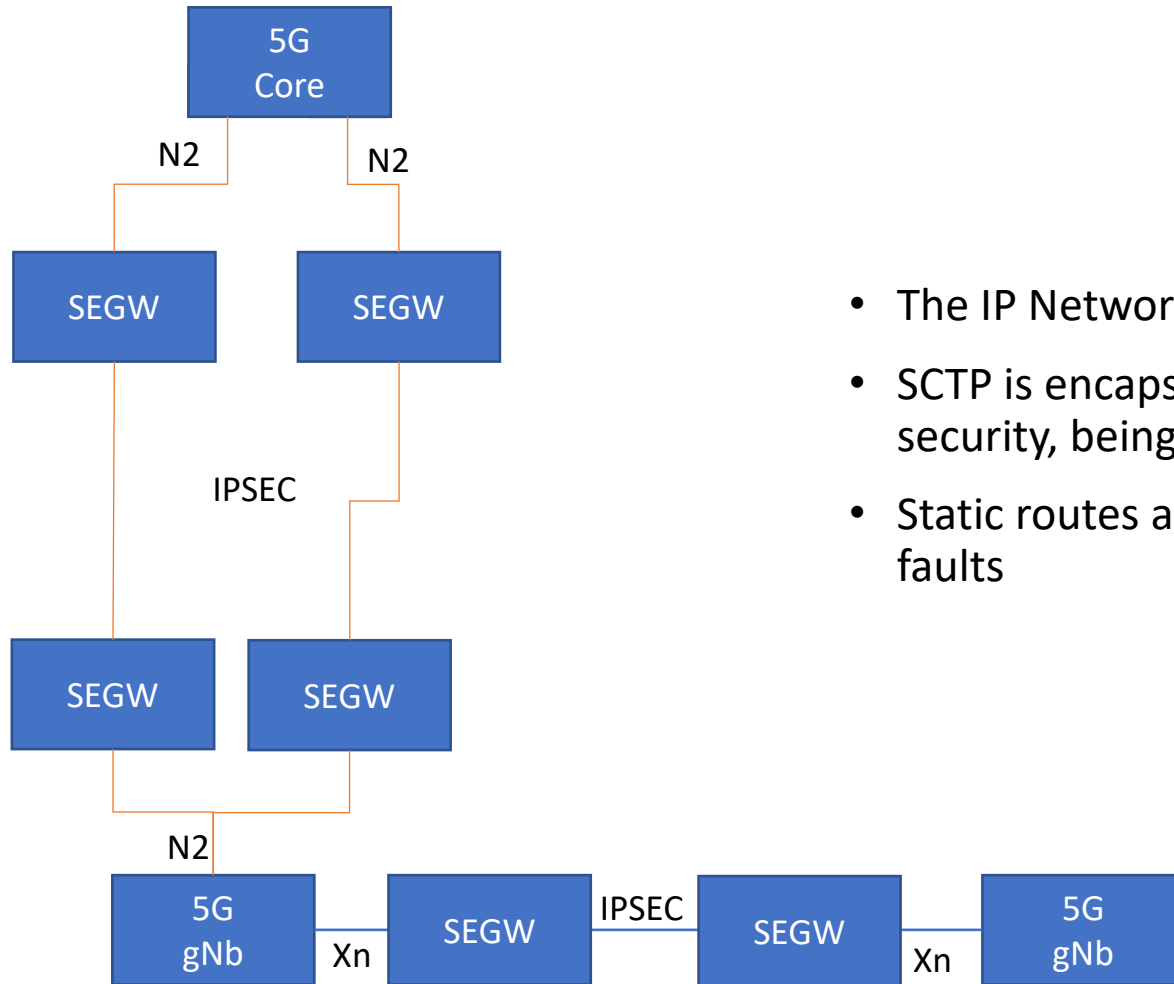
- The IP Network is designed in a connection-oriented fashion.

- SCTP is encapsulated in IPSec Tunnels, used for privacy and security, being kept separated for redundancy principles

- Static routes are used for avoiding domino effects in case of faults

SCTP features used in RAN

OFFICIAL rfc4960

- Semipermanent
- 2 Streams
- Multihoming
- In sequence delivery
- Encryption (rfc6083)
- PLPMTUD

UNOFFICIAL rfc4960

- Timers are much faster than what recommended
- Timer accuracy
- Link Supervision

The PING case in LTE

A UE is normally in idle mode, it has no fixed carrier assignment for Userplane Data transfer.

When waking up from idle, UE asks Core Network for resources.

The complete handshake requires 5 signals to be handshaked before UE has assigned carries, that is before it can send the first data.

3GPP requires the whole handshake to be accomplished in less than 100msec.

The execution of a PING from a UE will result with the time spent for handshake + the actual RTT of ICMP.

In a similar way, each change in resource allocation is accomplished via SCTP, thus SCTP directly affects the end user feeling about the responsiveness of the network.

The PING test is one of the Key Indicators used by Operators when validating Equipments.

The Superbowl case

When a Radio node looses the control plane with the Core Network it must shutdown the Radio resources immediately, this is needed for two reasons:

1. Avoid that Radio without control causes problems to the neighbor cells

2. Inform all the connected UE that the cell is not available and force them to reinitiate the connections to another cell

RAN needs to know that connections to Core Network has been lost as soon as possible, still it needs to be sure that the connection is lost, normally within 20 seconds.

A RAN node does retry a link for some 20 times and then declares it gone and shut down all radio resources.

The goal is to give to the user the less possible perception of disturbance.

LTE eNb

LTE eNb

Superbowl Stadium

LTE eNb

LTE eNb
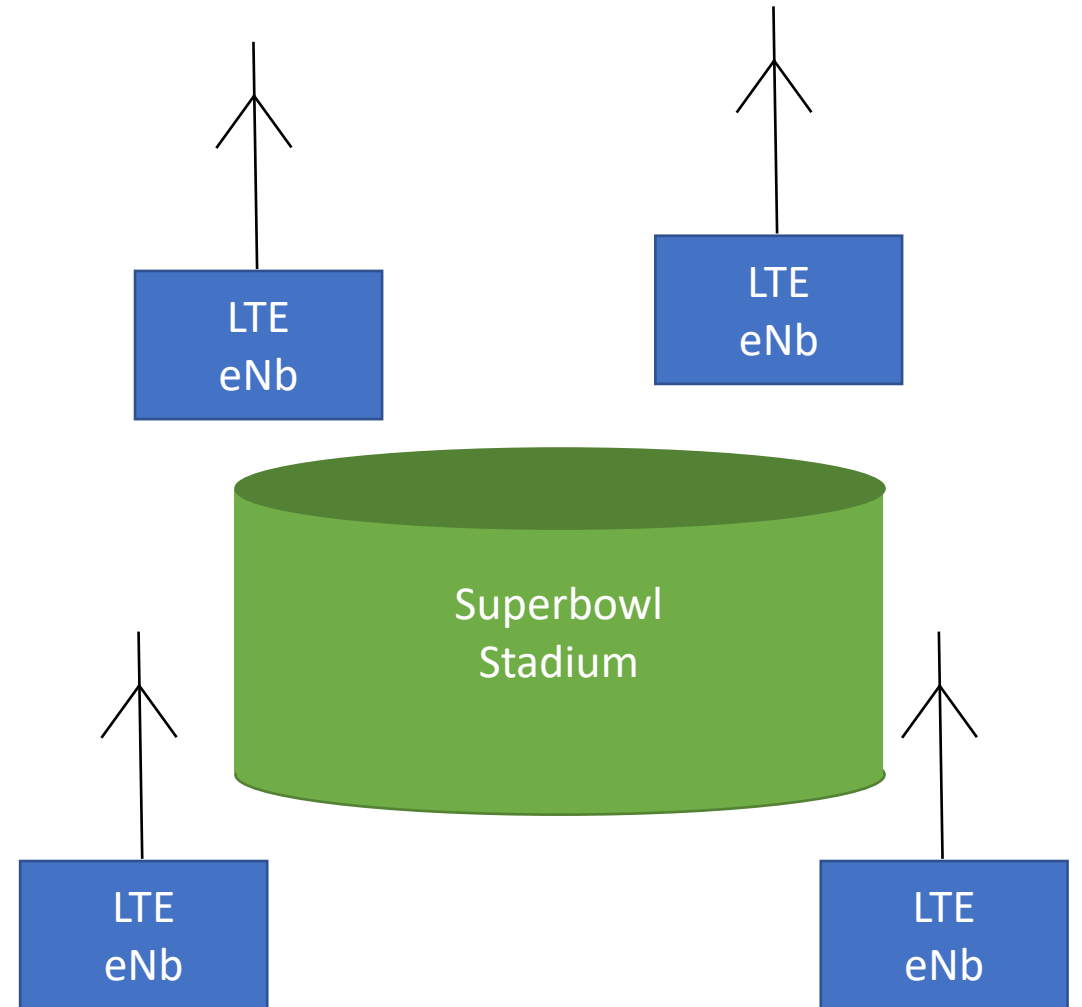
SCTP weakness

- Hard to make it work behind NAT

- Poor support in cloud environment (Kubernetes)

- Implementations in Kernel have side effects in User Space (limited to linux)

- Encryption is not a native feature. This will be improved with rfc6083bis.

- One association doesn't scale well for capacity.